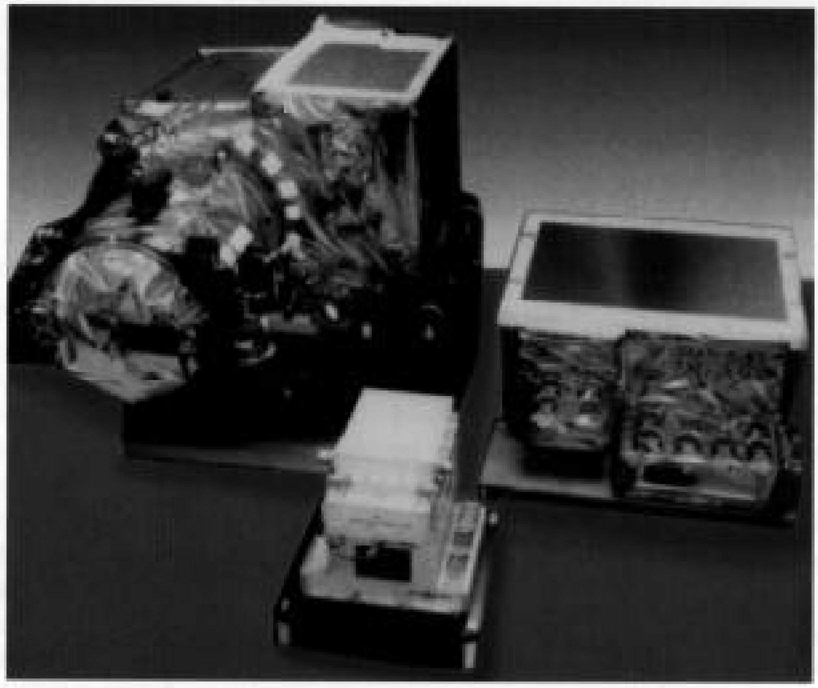
Space-Based Visible (SBV) Sensor



Specifications

Weight:	78 kg
Aperture:	15.2 cm diameter
Wavelength:	0.4–1.0 µm
Field of view:	1.4° × 6.6°
Resolution:	60 µradians
Power:	68 W

Objective

The Space-Based Visible (SBV) Sensor on the MSX satellite will demonstrate above-the-horizon surveillance of missiles and resident space objects (i.e., satellites) using a visible wavelength sensor from a space platform. The primary objectives are

- To demonstrate advanced visible band sensor technologies in space;
- To collect target and background phenomenology data and to perform functional demonstrations for BMD midcourse surveillance;
- To conduct experiments to support Air Force space based space surveillance missions.

Description

The SBV sensor system consists of the following units:

- Straylight rejection telescope utilizing an off-axis re-imaging design;
- CCD camera using 4 three-sided, abuttable-frame transfer CCDs in the focal plane;
- Signal processor for automatic target detection and background clutter suppression;
- Experiment controller for sensor command and control.

Management

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Contamination Instruments

Objective

Optical sensor performance in the space environment is degraded by the deposition of contaminants on critical sensor surfaces. Although the MSX spacecraft and its instruments were constructed in an ultraclean environment with low-outgassing materials, residual gases and contaminants from launch and from the atmosphere are trapped in the payload electronic units mounted around the spacecraft. Other contaminants result from outgassing by spacecraft materials and thermal expansion at terminator crossings. This contamination can seriously affect sensor performance and longevity. MSX carries a full set of sensors to monitor and measure contamination during the mission.

Description

- Neutral mass spectrometer (NMS)—a quadrupole RF instrument with two independently programmable filaments which can be operated at either low or high emission current modes.
- Ion mass spectrometer (IMS)—a Bennett RF positive ion mass analyzer with sampling port oriented towards the ram velocity vector during the park mode of the MSX spacecraft.
- Cold-cathode gauge type total pressure sensor.
- Temperature-controlled quartz crystal microbalances (TQCMs)—for measuring mass deposition on external surfaces of MSX.
- Cryogenically cooled quartz crystal microbalance (CQCM)—for measuring depositions on the SPIRIT III primary mirror.
- Xenon flashlamp—produces an intense beam of visible light for detection of back-scattered radiation by the UVISI wide FOV visible imager. Particles as small as 1 micrometer with velocities up to 1 meter/sec will be detected.
- Xenon flashlamp—works in conjunction with the UVISI spectrographic imager #3 to measure H_2O contamination through the OH radical byproduct of the ultraviolet photodissociation of water.

Operations

The Contamination Instrument Complement (CIC) has three modes:

- *Environmental Survey*—The CIC will monitor the decay of the contaminants and help determine when it is safe to operate the other experiments. This survey mode is estimated to last two weeks.
- *Contamination Monitor Mode*—A data record is made of the near-field environment and contaminants formed by the operation of the spacecraft. This mode will last for the two-year duration of the main MSX mission.
- *Data Collection Mode*—Data are collected to augment the mission data base, as a reference for future missions. This mode will last for as long as the CIC is functional.

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